RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES KARNATAKA

BANGALORE - 560 041

ORDINANCE GOVERNING M.B.B.S DEGREE PROGRAMME

1997

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4th 'T' Block, Jayanagar, Bangalore - 560 001. Tel : 6637058 (PABX), Fax : 6658569

No. ACA/BOS -27/97-98. Date : 24.03.98.

NOTIFICATION

Sub: Revised Ordinance governing M.B.B.S, course 1997-98

Ref:
1. Recommendations on the Graduate Medical Education 1997, (MBBS) course of Medical Council of India.
2. Minutes of the Meeting of the Syndicate held on 24th November 1997.
3. University letter of even No. dated 29.12.97 circulating restructured M.B.B.S. Curriculum of 1997-98.

\- - -

In exercise of the Powers conferrd on it under section. 35 (2) of the Rajiv Gandhi University of Health Sciences Act, 1994 the Syndicate has been pleased to approve the Revised Ordinance relating to MBBS course at its Meeting held on 24th November 1997 as given in the schedule here to Annexed.

The Revised Ordinance as specified in the scheduled shall come into force from the Academic year 1997 - 98.

By Order,
Sd/- S.R. Kanakaraj
Registrar

To,

The Principals of all Medical Colleges/
Institutions affiliated to Rajiv Gandhi
Univeristy of Health Sciences, Karnataka, Bangalore.

Copy to:-

1. Secretary to Governor, Raj Bhavan, Bangalore - 560 001.
2. Secretary to Govt., Medical Education, M.S. Building, Dr. B.R. Ambedkar Veedhi, Bangalore - 560 001.

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SECTION I

INTRODUCTION

The Medical Council of India (MCI) revised the M.B.B.S. curriculum. It came into effect from May 1997. Rajiv Gandhi University of Health Sciences will implement the new regulations for the batches of students admitted to the M.B.B.S. course in the academic year 1997-98.

The new regulations recommend :

(1) That the medical curriculum should be oriented towards educating students to take up the responsibilities of physicians of first contact. The medical graduate should be capable of functioning independently in both urban and rural environment.

(2) Every effort should be made to provide educational experience that allow hands-on-experience both in hospital as well as in community setting. For this purpose, a comprehensive list of clinical skills that a graduate must acquire at the end of the course including internship has been prepared.

(3) That maximum efforts be made encourage integrated teaching and every attempt be made to de-emphasise compartmentalisation of disciplines so as to achieve horizontal and vertical integration in different phases.

(4) That educational experience should emphasise health rather than only disease, and community orientation also instead of only hospital orientation. Population control and family planning should also be given due emphasis.

(5) Due importance to be given to teaching common problems of health and disease and to the national programmes.

(6) That every effort should be made to use learner oriented methods which would encourage cultivation of logical thinking, clarity of expression, independence of judgement, scientific habits, problem solving abilities, self initiated and self-directed learning.

(7) Reduction of didactic lectures (not more than 1/3 of total teaching hours) and increasing use of active methods of learning such as group discussions, seminars, role play, field visits, demonstrations, peer interactions etc. which would enable students to develop personality, communication skills and other qualities which are necessary.

(8) Examinations be designed with a view to assess not merely the knowledge but also practical and clinical skills, habits and values which are necessary for a graduate to carry out professional day to day work competently.

(9) Regular periodic assessment be done throughout the course for internal assessment. The assessment need not be limited to written tests. It should relate to other items such as maintenance of records, participation in seminars and group discussions, clinical case study, proficiency in carrying out practical or clinical skill or participation in projects and assignments (even) during vacation. These be evaluated objectively and recorded.

(10) That every medical institution should evolve institutional objectives which would be in consonance with the national goals (See Section II) and health policy. The institutional objectives should describe the attributes of their product.

(11) Shift in the role of medical teachers from mere imparting knowledge to that of a facilitator and motivator of student learning.

(12) That every medical college establish a medical education unit for faculty development, preparation of learning resource materials and improved evaluation methods.

Rajiv Gandhi University of Health Sciences endorses these recommendations. It strongly desires that affiliated colleges should implement these while conducting the MBBS course.

Doctors and other health professionals are confronted with many ethical issues and problems. With advances in science and technology, these problems are on the increase. It is necessary for every doctor to be aware of these problems. The doctors should also be trained to analyse the ethical problems as they arise and deal with them in an acceptable manner. It is therefore recommended that teaching of medical ethics be introduced in phase I and continued throughout the course including the internship period.

In order to implement the new regulations, from the academic year of 1997-98 it was necessary for this University to restructure the I MBBS course. The goals and general objectives of MBBS education is given in Section II. The eligibility for admission, duration of the course, recommendations regarding attendance, internal assessment, distribution of marks for Phase-I professional examination subjects, criteria for pass, number of chances and grounds for migration are given in Section III. Revised course contents, teaching schedule and scheme of examination are given in Section IV. The section V contains the topics recommended for teaching of medical ethics.

SECTION II

OBJECTIVES OF MEDICAL GRADUATE TRAINING PROGRAMME (MCI REGULATIONS, 1997)

The MCI has stated the goals and general objectives of graduate medical education in the new regulations. They are given in this section . It is desired that in consonance with these national goals, each medical college should evolve institutional objectives.

(1) NATIONAL GOALS:

At the end of undergraduate programme, the medical student shall endeavour to be able to:

(a) Recognise 'health for all' as a national goal and health right of all citizens and by undergoing training for medical profession fulfil his / her social obligations towards realisation of this goal;

(b) Learn every aspect of National policies on health and devote himself / herself to its practical implementation;

(c) Achieve competence in practice of holistic medicine, encompassing primitive, preventive, curative and rehabilitative aspects of common diseases;

(d) Develop scientific temper, acquire educational experience for proficiency in profession and promote health living;

(e) Become exemplary citizen by observation of medical ethics and fulfilling social and professional obligations, so as to respond to national aspirations.

(2) INSTITUTIONAL GOALS

The undergraduate students coming out of a medical institution should:

(a) Be competent in diagnosis and management of common health problems of individual and the community, commensurate with his / her position as a member of the health team at the primary, secondary or tertiary levels, using his / her clinical skills based on history, physical examination and relevant investigations;

(b) Be competent to practice preventive, promotive, curative and rehabilitative medicine in respect to the commonly encountered health problems;

(c) Appreciate for different therapeutic modalities, be familiar with the administration of the "essential drugs" and their common side effects;

(d) Be able to appreciate the social-psychological, cultural, economic and environmental factors affecting health and develop humane attitude towards the discharging one's professional responsibilities;

(e) Possess the attitude for continued self learning and to seek further expertise or to pursue research in any chosen area of medicine;

(f) Be familiar with the basic factors which are essential for the implementation of the

National Health Programs including practical aspects of the following:-

(i) Family Welfare and Maternal and Child Health [MCH],

(ii) sanitation and water supply,

(iii) Prevention and control of communicable and non-communicable diseases,

(iv) Immunisation,

(v) Health Education;

(g) Acquire basic management skill in the area of human resources, materials and resource management related to health care delivery;

(h) Be able to identify community health Problems and learn to work to resolve these by designing, instituting corrective steps and evaluating outcome of such measures;

(i) Be able to work as a leading partner in health care teams and acquire proficiency in communication skills.

(j) Be competent to work in a variety of health care settings

(k) Have personal characteristics and attitude required for professional life such as personal integrity, sense of responsibility and dependability and ability to relate to or show concern for other individuals.

(l) All efforts must be made to equip the medical graduate to acquire the detailed in Appendix B of Medical Council of India Regulations on Medical Education, 1997.

SECTION III

ORDINANCE GOVERNING M.B.B.S. DEGREE PROGRAMME

ELIGIBILITY FOR ADMISSION, DURATION, ATTENDANCE AND SCHEME OF EXAMINATION

1. ELIGIBILITY

A candidate seeking admission to I MBBS course shall have passed :

i) two years P.U.C. examination conducted by the P.U.C. Board, Karnataka State with English and Physics, Chemistry and Biology as optional subjects or any other examination recognised as equivalent by the Rajiv Gandhi University of Health Sciences.

or.

ii) Intermediate examination in Science of an Indian University/Board or other recognised examining body with Physics, Chemistry and Biology, which shall include a practical test in these subjects and also English as compulsory subject.

or.

iii) first year of the three year degree course of a recognised University with Physics, Chemistry and Biology including a practical test in these subjects provided the examination is an 'University Examination'.

or.

iv) B.Sc., Examination of an Indian University, provided that he/she has passed the B.Sc., examination with not less than two of the following subjects - Physics, Chemistry, Biology (Botany, Zoology) and further that he/she has passed either the qualifying examination with the following subjects:- Physics, Chemistry, Biology and English.

or.

v) Any other examination which in scope and standard is found to be equivalent to the intermediate science examination of an Indian University/Board, taking Physics, Chemistry and Biology including a practical test in each of these subjects and English. Provided that:-

a) In case of admission on the basis of qualifying examination to medical course a candidate must have obtained not less than 50 percent marks in English and 50 percent marks in Physics, Chemistry and Biology taken together in the qualifying examination.

b) In case of admission on the basis of a Competitive Entrance Examination to Medical course, a candidate must have obtained not less than 50 percent marks in English and 50 Percent marks in Physics, Chemistry and Biology taken together.

However, in respect of Schedule Caste/Scheduled Tribe and Category - I candidates, the minimum marks required for admission shall be 40%, in lieu of 50% for general candidates.

The candidate should have completed 17 years on or before 31st day of December of the year of admission.

2. DURATION OF THE COURSE

i) Every student shall undergo a period of certified study extending over 4½ academic years from the date of commencement of his study for the subject comprising the medical curriculum to the date of completion of the examination followed by one year compulsory rotating Internship. The 4½ years course has been divided into three phases.

1. Phase - I - 1 year, consisting of two terms of 6 months each.
2. Phase - II - 1½ years, consisting of three terms of 6 months each.
3. Phase - III - 3½ years, after Phase - I, consisting of 7 terms

ii) The first year shall be occupied in the study of the Phase - I (Pre Clinical) subject of Human Anatomy (650 hours), Physiology including Bio Physics (480 hours), Bio Chemistry (240 hours) and Introduction to Community Medicine (60 hours). A detailed syllabus is given in Section IV A.

iii) After passing pre-clinical subjects in Phase - I, the Phase - II shall be 3 terms (1½ years), devoted to Para Clinical and Clinical subjects. Para Clinical subjects shall consist of Pathology, Pharmacology, Microbiology. Forsenic Medicine including Toxicology and part of Community Medicine. (Details of Syllabus will be circulated separately). During this phase the clinical subjects shall be taught currently. The clinical subjects taught will be Medicine and Surgery and their allied specialities respectively. Obstetrics and Gynecology.

iv) Phase - III consists of clinical subjects, Medicine and its allied specialists, Surgery and its allied specialities, Obstetrics and Gynecology and Community Medicine. (Details of Syllabus will be circulated separately).

3. ACADEMIC TERMS

The admission of I M.B.B.S shall be done only once in a given year. The Academic term the course shall commence on or about 1st August each year. However, in extraordinary cases, the Vice-Chancellor may extend the last date of admission upto 16th September. A candidate admitted under such circumstances shall put in a course of work of atleast fifteen days during the ensuing vacation period.

All candidates admitted beyond that last date stipulated by the University shall have to appear for I Professional Examination to be held subsequent to the regular examination after completion of the prescribed duration.

4. ATTENDANCE

Every candidate should have 80 percent attendance of the total classes conducted in theory, practical and clinical separately in each calendar year calculated from the date of commencement of the term to the last working day as notified by the University in each of the subjects prescribed to be eligible to appear for the Examination.

The Vice Chancellor may, however, consider to condone shortage of attendance not beyond 10 percent for the following reasons only:-

i) Participation in the sports at the University/State/National Level.

ii) Illness of a candidate causing diassibility supported by a Medical Certificate.

iii) Death of parent or a supporting guardian.

iv) Disturbed conditions as declared by the Government in the area of the college.

The Principal should notify at the College the attendance details at the end of each term without fail under intimation to this University.

A candidate lacking in the prescribed attendance and progress in any one subject in theory and practical/clinical in the first appearance should not be permitted to appear for the Examination.

SCHEME OF EXAMINATION

5. INTERNAL ASSESSMENT

It shall be based on evaluation assignment, preparation of seminar, clinical presentation etc., (see Annexe - I. for examples). Regular periodic examinations should be conducted throughout the course. Although the question of number of examinations is left to the institution, there should be a minimum of atleast three (3) sessional examinations during

Phase - I of the course and average of best two examination marks should be taken into consideration while calculating the marks for the internal assessment. Day to day records should be given importance in the internal assessment. The weightage given to internal assessment is 20% out of total marks assigned for a subject. In case of Anatomy and Physiology, the internal assessment marks would be 60 (Theory 40 and Practical 20) and for Biochemistry it would be 30 marks (Theory 20 and Practical 10). Five marks are alloted to records out of the 20 marks of internal assessment practical in Anatomy and Physiology respectively and none for Biochemistry records.

Proper record of the work should be maintained which will be the basis of all students internal assessment and should be available for scrutiny.

INTERNAL ASSESSMENT FOR ANATOMY & PHYSIOLOGY

Total Marks : 60 (Theory - 40 and Practical - 20.)

Theory : Minimum of three examinations are recommended. The sessional examination preceding the University examination may be similar to the pattern of University examination. Average of any two best marks obtained in the notified internal examinations may be taken into consideration for calculating internal assessment. The total marks be reduced to 40 and sent to the University.

Practicals :

There will be two terminal practical examinations. Five marks will be for records and 15 marks for terminal examinations. Average marks of the two terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the University.

The internal assessment marks both theory and practical obtained by the candidates should be sent to the University atleast fifteen days prior to the commencement of theory examination.

INTERNAL ASSESSMENT FOR BIO-CHEMISTRY

Total Marks : 30 (Theory: 20 and Practical: 10)

Theory: Minimum of three examination are recommended. The examination preceding the University examination will be similar to the University examination. The total marks would be 20. Average marks of best of two notified internal examinations should reduced to 20 and should be sent to the University.

Practicals: A minimum of two practical tests is to be conducted, one at the end of each term. Average of the two tests should be reduced to 10 marks and shall be sent to the University.

6. UNIVERSITY EXAMINATION - SUBJECTS & MARKS.

PHASE - I.

The subjects for first professional University examination and the distribution marks will be as follows: -

A. THEORY	ANATOMY	PHYSIOLOGY	BIO CHEMISTRY
1. **Written Paper** No. of Papers & Maximum Marks for each paper.	2x100 = 200	2x100 = 200	1x100 = 100
2. Viva-Voce (Oral Examination).	60	60	30
3. Internal Assessment. (Theory)	40	40	20
Total Theory	**300**	**300**	**150**
B. PRACTICAL			
1. Practicals	80	80	40
2. Internal Assessment (Practical)	20	20	10
Total Practicals	**100**	**100**	**50**
GRAND TOTAL	**400**	**400**	**200**

7. SUBMISSION OF LABORATORY RECORD NOTE BOOK:

a) At the time of Practical/Clinical Examination each candidate shall submit to the Examiners his/her laboratory note book duly certified by the Head of the Department as a bonafide record of the work done by the candidate.

b) The candidate may be permitted by the examiners to refer the practical record book during the Practical Examination in the subject of Biochemistry only. No other material, handwritten, cyclostyled or printed guides is allowed for reference during the practical examination.

8. ELIGIBILITY FOR EXAMINATION:

To be eligible to appear for University examination a candidate:-

a) should have undergone satisfactorily the approved course of study in the subject/ subjects for the prescribed duration.

b) should have attended atleast 80% of the total number of classes in theory and practical/clinical, seperately, to become eligible to appear for examination in that subject/subjects.

c) should fulfil any other requirement that may be prescribed by the University from time to time.

d) who fails in any subject/subjects of MBBS Phase - I, has to put one academic term before he/she becomes eligible to appear for the next examination.

e) should pass in all the Phase I (Pre-Clinical) subjects, before joining the Phase II (Para-Clinical) subjects, for which he will be permitted not more than four chances (actual examination), provided four chances are completed in three academic years from the date of enrolment.

9. CRITERIA FOR PASS.

For declaration of pass in any subject at the University examination, a candidate shall pass both in Theory and Practical/Clinical Examinations seperately, as stipulated below:-

Theory consists of marks obtained in University Written paper(s), Viva-Voce examination and Internal Assessment (Theory). For a pass in theory, a candidate shall secure a minimum of 40% marks prescribed for University written examination and 50% marks in aggregate i.e., marks obtained in written examination, viva-voca examination and internal assessment (theory) added togeather. For a pass in practical/clinical examination, a candidate shall secure a minimum of 40% marks in Univerisity conducted practical/clinical examination, and 50% marks in aggregate, i.e., marks obtained in above said practical/clinical examiniation and internal assessment (practical) added together

A candidate not securing 50% marks in aggregate in either Theory or Practical/ Clinical Examination in a subject shall be declared to have failed in that subject and is required to appear for both Theory, and Practical/Clinical again in next subsequent examination in that subject.

10. DECLARATION OF CLASS:

a) Provided successful candidate obtaining 65% marks or more but less than 75% of marks in the aggregate of all the subjects in the first attempt will be declared to have passed the Exam in First Class. Successful candidates obtaining 75% of Marks or more in the aggregate of all the subject in First attempt will be declared to have passed the Examination in distinction.

A candidate obtaining 50% and more, but less than 60% of the marks in the grand total aggregate in the first attempt shall be declared to have passed the examination in Second class. A candidate passing an University examination in more than one attempt shall be placed in Pass class irrespective of the percentage of marks secured by him/her in the examination.

b) Only those candidates who have passed all the prescribed subjects in the University Examination in the first attempt shall be eligible for the award of a rank.

Ranks shall be declared on the basis of the higherst aggregate marks obtained by a candidate in all the subjects of the course prescribed for an University Examination. The First ten ranks shall be awarded for each course, every year.

11. NUMBER OF CHANCES:

No student shall be permitted to join Phase - II (Para Clinical & Clinical) Group of subjects until he/she passes in all the Phase - I (Pre Clinical) subjects for which he /she will be permitted not more than four chances (actual Examination) proveided four chances are completed with in three years from the date of enrolment.

The Principals should ensure that each candidate seeking admission to I M.B.B.S. course gives an affidavit in writing that the candidate abides by the above ordinance.

12. MIGRATION

a) Migration from one medical college to another is not a right of a student. However, migration of students from one medical college to another medical college in India may be considered by Medical Council of India, only in exceptional cases on extreme compassionate grounds*, provided following criteria are fulfilled. Routine migrations on other grounds shall not be allowed.

b) Both the colleges, i.e., one at which the student is studying at present and one to which migration is sought, should have been recognised by the Medical Council of India.

c) The applicant candidate should have passed first professional MBBS examintion.

d) The applicant candidate should submit his/her application for migration complete in all respects, to all authorities concerned within a period of one month of passing (declaration of results) the first professional Bachelor of Medicine and Bachelor of Surgery (MBBS) examination.

e) The applicant candidate must submit an affidavit stating that he/she will pursue 18 months of prescribed study before appearing for II professional MBBSexamination at the transferee medical college, which should be duly certified by the Registrar of the concerned University in which he/she is seeking transfer. The transfer will be applicable only after receipt of the affidavit.

NOTE I :

i. Migration during clinical course of study shall not be allowed on any ground.

ii. All applications for migration shall be referred to Medical Council of India by college authorities. No institution/University shall allow migration directly without the approval of the Council.

iii. Council reserves the right, not to entertain any application which is not under the prescribed compassionate grounds and also to take independent decisions where applicant has been allowed to migrate without referring the same to the Council.

NOTE II : * Compassionate grounds criteria:

i. Death of a supporting parent or guardian

ii. Illness of the candidate causing disability

iii. Disturbed conditions as declared by Government in the Medical College area.

Scheme of University examination, subjects and distribution of marks of Phase-II and Phase-III Examinations and weightage for Internal Assessment will be notified later.

SECTION IV-A

COURSE OF STUDY (SYLLABUS) AND SCHEME OF EXAMINATION

ANATOMY

a. GOALS & OBJECTIVES

GOALS

The broad goal of teaching of Anatomy is to prepare students with basic knowledge of structure and its correlation with function, growth and development of human body and to apply the knowledge in clinical practice.

OBJECTIVES

At the end of the course, the student should be able to :

KNOWLEDGE:

1. Comprehend the normal disposition, clinically relevant interrelationship, functional and cross-sectional anatomy of various structures in the body.
2. Identify the microscopic structure and correlate elementary ultra structure of various organs and tissues and correlate the structure with the functions as a pre-requisite for understanding the altered state in various disease processes.
3. Comprehend the basic structure and connections of the central nervous system to analyse the integrative and regulative functional of the organs and systems. He/She should be able to locate the site of gross lesions according to the deficits encountered.
4. Demonstrate knowledge of principles and sequential development of the organs and systems, recognise the critical stages of the development and the effects of common teratogens, genetic mutations and environmental hazards. He/She should be able to explain the developmental basis of major various abnormalities.
5. Point out the features of various appearances of normal human body in skiagrams after routine Radiological investigations.
6. Understand the principles of karyotyping and identify the gross congenital anomalies.
7. Understand the principles of newer imaging techniques and interpretation of CT Scans and Sonograms.
8. Understand clinical basis of some common clinical procedures i.e., intramuscular, intravenous injections, lumbar puncture and kidney biopsy.

SKILLS

1. Identify and locate structures of the body and mark the topography of living anatomy.
2. Identify the organs and tissues under microscope.

INTEGRATION

From the integrated teaching of other basic sciences, radiology and surgery the students should be able to comprehend the regulation and integration of the functions of the organs and systems in the body, thus interpret the anatomical basis of disease process.

SYLLABUS AT A GLANCE FOR M.B.B.S. PHASE -I COURSE

1.	General Anatomy	:	Basic tissues of body. Terminology and nomenclature. History and anatomy.
2.	Elements of Anatomy	:	Osteology Arthrology Myology Angiology Neurology
3.	Regional Anatomy	:	Upper limb, Lower limb, Thorax - including diaphragm Abdomen and Pelvis Head, Neck, Brain and Spinal cord
4.	Embryology Gen-Embryology	:	Development of individual organs and systems. Postnatal Growth & Development
5.	Histology	:	General Histology, Microanatomy of individual organs and systems.
6.	Human Genetics	:	Principles of Human genetics and Molecular biology.
7.	Radiological Anatomy	:	Skiagrams. Special X-Rays Principles of imaging techniques.
8.	Surface Anatomy	:	In cadavers In the living.
9.	Sectional Anatomy	:	of Thorax, Abdomen, Head,Neck and Brain
10.	Applied Anatomy		

b. COURSE CONTENTS

1. THEORY

I. GENERAL EMBRYOLOGY:

1.a. Definition of embryology, brief account of male and female reproductive system, gestation period subdivisions :: testis, ovary; definition of gamete; sperm, ovum, gametogenesis, migration of primordial germ cells into gonadal ridge; structure of sperms, growth of ovarian follicles, ovarian and uterine cycles.

b. Principles of Family Planning (contraception), Invitro fertilisation (for integrated teaching)

First week of Development

2. Definition and process of fertilisation, formation of zygote; cleavage division; formation of morula and blastocyst; implantation; formation of decidua - its subdivision. Types of implantation and abnormal sites of implantation.

Second week of Development

3. Differentiation of embryoblast and trophoblast ; changes in the embryoblast - bilaminar germ disc; changes in the trophoblast, formation of cytotrophoblast, syncytiotrophoblast, amniotic membrane, yolk sac, extra embryonic mesoderm and extra embryonic coelom and connecting stalk, formation of chorion, amniotric caviaty, primary yolk sac cavity; appearance of prochordal plate.

Third week of Development

4. Appearance of primitive streak and primitive node; formation of intraembryonic mesoderm resulting in trilaminar germ disc; formation of notochord, buccopharyngeal and cloacalmembranes, pericardial bar, paraxial, intermediate and lateral place mesoderm, secondary yolk sac, intraembryonic coelom and allantonic diverticulum; derivatives of ectoderm, endoderm and mesoderm.

Fourth to Eighth week of Development

5. Formation of somities, neural tube, cephalocaudal folding, lateral foldings, body form stomodeum, proctodeum, gut and vitelline duct; subdivisions of gut into foregut, midgut and hindgut.

Placenta

8. Formation of placenta and chorionic villi; decidua basalis; features and functions of placenta; placental circulation; abnormalities, placental barrier, types of placenta.

Umbilical Cord

9. Formation of umbilical cord; features of umbilical cord.

Amniotic Cavity

10. Amniotic cavity and membrance; amniotic fluid-functions; expansions of amniotic cavity and fusion with chorion; chorion leave with decidua capsulaaris; decidua capsularis with parientalls; obliteration of chorionic and uterine cavities; function of fused foetal membranes to dilate cervical canal.

11. Formation of twins and types of twins and multiple pregnancies. Conjoined twins.

Teratology

12. Genetical and environmental factors as causative factors for congenital malformations.

II. SYSTEMIC EMBRYOLOGY

1. Development of the individual organs of digestive system, genital system, urinary system, respiratory system, cardiovascular system, *nervous system, special sensory* organs(in brief), endocrine glands and mammary gland.

2. Developmental abnormalities.

3. Development of skeletal system, muscular system (in brief)

4. Development of face and the branchial apparatus and the associated congenital anomalies.

III. OSTEOLOGY

1. Names of the bones of the body and their positions; classification of the bones with examples; general features general pattern of blood supply; desirable to know determination particular features: Relations of Blood vessels and nerves to bones.

   Skull - All normal and interior of skull, Foetal skull, mandible.

IV. MUSCULAR SYSTEM

1. Classification and identification of the muscles of the body; *main attachments,* nerve supply and action; Actions of muscle groups on functional basis, with reference to joints.

V. ARTHROLOGY

1. Classification of joints, general features of different types of joints, *detailed study of the following joints* of the body with movements. Shoulder, elbow, wrist, hip, knee, ankle and temporomandibular joint.

REGIONWISE

Thorax

VI. CARDIO-VASCULAR SYSTEM

1. Pericardium, Thorax wall, position and parts of the heart, conducting system, blood supply and nerve supply of heart names of the blood vessels and their distribution in the body; regionwise.

2. Developmental anomalies (as part of embryology)

VII. RESPIRATORY SYSTEM

Pleura and lungs position, parts, relations, blood supply. Lungs - emphasis on Bronchiopulmonary segments.

Mediastinum - Superior - arch of aorta.

Posterior - Thoracic duct, esophagus and Azygos system of veins.

Diaphragm - with never supply.

VIII. ABDOMEN AND PELVIS

Peritoneum - General disposition - horizontal and vertical; viscera general disposition, position, parts, relations, blood supply and nerve supply of abdominal organs.

IX. PELIVC ORGANS

Parts, position, relations, blood supply, nerve supply.

X. ENDOCRINAL SYSTEM AND INDIVIDUAL ENDOCRINE GLANDS (Regionwise)

1. Organs, relations, blood supply, nerve supply, microscopic anatomy and normal development.
2. Clinical manifestations of common endocrine disorders.

XI. NERVOUS SYSTEM AND ITS COMPONENTS:

1. Parts of nervous system, meninges, ventricles, motor and sensory pathways, cranial nerve,functional areas, normal development, microscopic anatomy of neurons, motor and sensory cortex and their blood supply with cross sectional studies, morphology of spinal cord.

Sections of Medulla	-	a) At Pyramidal deccusation b) Sensory deccusation c) Open part of Medulla
Pons	-	Mid level
Midbrain	-	a) Superior colliculus b) Inferior colliculus
Cerebellum	-	Horizontal
Cerebrum	-	a) Mid Saggital section b) Horizontal section at interventicular formation c) Coronal section at Anterior commissure d) Coronal section at mammillary body

2. Common neurological disorders: case studies, demonstration.

XII. SPECIAL SENSORY ORGANS (Regionwise)

Gross anatomy of eyeball, ear, nose and tongue.

XIII. LYMPHATIC SYSTEM

1. Spleen and Thymus (Regionwise)
2. Gross anatomy of the major groups (regionwise) of the lymph nodes of the body and their drainage areas. Gross anatomy of the major lymphatics specially thoracic duct and its tributaries.

XIV. MICRO ANATOMY- 12 General topics, 15 systemic topics. (wide separate list attached)

Study of microscopes and artefacts.

1. General Histology, study of the basic tissues of the body; functional correlation of the structural components of the organs.
2. Systemic histology of concerned organs.

XV. POSTNATAL GROWTH AND DEVELOPMENT (for integrated teaching)

1. Meaning of the terms like growth, development, principles of growth and development, *types of postnatal growth, periods of growth* and development and factors influencing them. Assessment of growth and development, Genetic aspects of Growth & development.

2. Milestones of development, growth and development during adolescence.(for integrated teaching)

XVI. RADIOLOGICAL ANATOMY

Identification of normal anatomical features in skiagrams, including special radiological investigations; (Barium meal, IVP, CT Scan, Ultrasound, Histosalpingography and cholecystography), MRI.

XVII. SURFACE ANATOMY

Surface features of the body and projection of the outline of heart, lungs, pleura, liver, kidneys, ureter and important blood vessels and nerves.

XVIII. CROSS SECTIONAL ANATOMY

Cross sections of head and neck, thorax, abdomen and pelvis at different levels to understand the interrelations of organs at the following levels:

THORAX	- T-3, T-4, T-5 Levels	- Horizontal section
ABDOMEN	- L-1, L-2, L-4 Levels	- Horizontal section
Pelvis	- Saggital section male and female	
Head & Neck	- Mid saggital section and horizontal sections at C4 & C6	
Brain	- already mentioned	- In neuro anatomy

XIX. GENETICS - 9 Lectures & Practicals

Introduction - DNA, RNA, Protein Synthesis, Mitosis and Meiosis, Chromosomes - Methodology, Chromosomal abnormalities - Non dysjunction, Numerical abnormalities, (Down Synd Rome, Turners and Kline felters Syndrone), Chronoic abnormalities, (structures deletions, translocation, invertion), Dermatogly, auto radiography, pedigree chart, Types of Inheritance, Autosomal deominant & autosomal recessive inheritance, Inborn Errors of metabolism. Genetic courseling, Pedigree charts.

2. PRACTICALS

GROSS ANATOMY : *Time : Total 32-34 Wks.*

Upper Limb: **Dissection:** Pectoral and scapular regions and shoulder region, arm, forearm .(5 wks)

Prosected parts: **Joints, Palm and dorsum of hand.**

Thorax :	**Dissection :**	Chest wall, mediastinum, lungs, and heart. Cross sections at T-3, T-4 and T-5 Levels (3 wks)
Abdomen:	**Dissection :**	Anterior abdominal wall and inguinal region. Viscera and posterior abdominal wall - Cross sections at L-1, L-2 and L4 levels (4 wks).
Pelvis :	**Dissection:**	Pelvic viscera and blood vessels and nerves - saggital section male and female (2 wks) *Prosected Parts :* **Perineum including ischio-rectal fossa**
Lower Limb :	**Dissection :**	Gluteal region, front and back of thigh, popliteal fossa, leg and dorsum of foot. (4 wks) *Prosected Parts:* **Sole of the foot and joints.**
Head & Neck :	**Dissection:**	Scalp, Superficial and deep dissection of face and neck. (8 wks to 10 wks) *Prosected Parts:* **Orbit, eyeball, submandibular region, Temporal and infratemporal fossa, cranial cavity, naso and oropharyngeal regions, Ear, larynx and pharynx. Cross sections at C-4, C-6 and levels. Sagital section of Head & Neck.**

NERVOUS SYSTEM

Sections of brain and prosected specimens and major functional areas. Gross structure of brain and spinal cord and study of gross sections as mentioned earlier.

DEMONSTRATIONS

- Bones- as described in osteology section
- Brain and spinal cord
- Cross-sectional anatomy
- Radiological anatomy
- Ultrasound CT and MRI

MICROSCOPIC ANATOMY

Stained slides of all the tissues and organs.

DEVELOPMENTAL ANATOMY

- Models to demonstrate various stages of early foetus and different organs development.
- Slides of ovary and testis to show follicles and stages of maturation of spermatozoa; and early chick and pig embryo.

GENETICS

Demonstration of :

1. Karyotyping, Normal XX and Normal XY Mitosis & Meiosis,
2. Karyotype of DS, KFS, TS, clinical features of DS, KFS, TS, Buccal Smear of Chromatin, Different Banding Photographs.
3. Pedigree of case given, Pedigree of student, demonstration of dermatoglyphics.

SPECIFIC SKILLS : Students should learn the following skills

1. To demonstrate surface marking of important organs
2. To localise important pulsations and the structure against which pressure can be applied in case of bleeding from a particular artery.
3. To locate superficial and deep reflexes.
4. To demonstrate muscle testing and movements at joints.
5. To locate sites for: Lumbar puncture, sternal puncture, pericardial tapping, liver biopsy.
6. To locate veins for venae puncture.
7. To locate the site for emergency tracheotomy.
8. Locate the subcutaneous positions of large nerves.
9. Preparation of Histology drawings.

HISTOLOGY

Practical classes (of 2 hrs. duration) together with 1 hour Lecture.

General Histology

1. Microscope
2. Cell
3. Epithelial Tissues I
4. Epithelial Tissues II
5. Connective tissue
6. Muscular tissue
7. Never tissue (Ts & Ls of peripheral nerve, sensory & sympathetic ganglia, optic nerve)

8. Epithelial glands (serous , mucous and mixed salivary gland)
9. Circulatory system (large artery, medium sized artery, layer vein,)
10. Lymphatic System (lymph nodes, thymus, tonsil, spleen)
11. Skin & appendages
12. Placenta & umbilical cord

Systemic Histology

1. Respiratory system
2. Oesophagus & stomach
3. Liver, gall bladder, pancreas
4. Small & large intestine
5. Urinary System I (kidney)
6. Urinary System II (Ureter, bladder, urethra)
7. Reproductive System - female
8. Reproductive System - male (omit seminal vesicle, & penis)
9. Upper GIT (Lip, tongue)
10. Hypophysis cerebri, thyroid, suprarenal
11. Eye (Cornea, Retina) (omit sclero corneal junction)
12. Neuro histology - The slides to be shown for Neuro histology are given below:

1.	Spinal Cord	i.	Cross section (CS) at mid thoracic level
2.	Medulla	i.	C.S. at Pyramidal level
		ii.	C.S. at upper medulla
3.	Pons	i.	C.S. at lower pons
		ii.	C.S. at upper pons
4.	Midbrain	i.	C.S. below collicular level
		ii.	C.S. at agranular cortex.
5.	Cerebral cortex	i.	C.S. at granular cortex
		ii.	C.S. at agranular cortex
6.	Cerebellum	:	Structure of cortex

Note: Desirable to know (not for evaluation)
Mammary Gland
Lacrimal Gland
Histology of Ear : Deleted

c. TEACHING HOURS

Lectures	-	4 Hrs. per week
Tutorials	-	1 Hr. per week
Group Discussion	-	1 Hr. per week
Practicals	-	2 Hrs. per week
Dissection	-	8 Hrs. per week
		(16 Hrs. per week approx)

AREAS FOR INTEGRATED TEACHING (Vertical Integration)

Organising Department: **Anatomy**

SL. NO.	AREA/ SUBJECT	DEPARTMENT(S) TO BE INVOLVED
1.	Anatomical basis of birth control measures	Obstetrics & Gynaecology and Surgery
2.	Postnatal growth and development	Paediatrics and Community Medicine.
3.	Antenatal growth and development	Obstetrics & Gynaecology & Community Medicine.
4.	Genetics disorders	Various clinical departments
5.	Neuro-Anatomy	Physiology and Medicine.
6.	Kinesiology-movements at various joints.	Orthopaedics.
7.	Embryologica basis of important & common congenital anomalies	Paediatrics, Obstetrics and Gynaecology.

d. SCHEME OF EXAMINATION

INTERNAL ASSESSMENT

Total marks: 60, Theory : 40 and Practical : 20

THEORY: Minimum of three examinations are recommended. The sessional examination preceding the university examination may be similar to the pattern of university examination. Average of any two best marks obtained in the notified internal examinations may be taken into consideration for calculating internal assessment. The total marks be reduced to 40 and sent to the university.

PRACTICALS: Total marks : 20

There will be two terminal practical examinations. Five marks will be for records and 15 marks for terminal tests. Average marks of the two terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and sum of the two shall be sent to the university.

The internal assessment marks both theory and practical obtained by the candidates should be sent to the university atleast fifteen days prior to the commencement of theory examination.

UNIVERSITY EXAMINATION

THEORY

There shall be two papers each carrying 100 marks. The pattern of questions would be of three types.

Long essay question	- each question carrying	10 Marks
Short essay question	- each question carrying	5 Marks
Short answer questions	- each question carrying	2 Marks

Distribution of chapters for paper I and II with weightage of marks in Anatomy for University Examination

PAPER - I

Topics	Marks
Head and Neck	30
Brain, Spinal cord	10
Upper limb	20
Thorax including diaphragm	20
General Anatomy } General Embryology } General Histology }	20
Total	100

PAPER - II

Topics		Marks
Abdomen		30
Pelvis & Perineum		20
Lower limb		20
Systemic Histology	10 }	
Genetics	10 }	30
Systemic Embryology	10 }	
Total		100

Chapterwise distribution of type of questions and marks

PAPER - I

CONTENTS	TYPE & NO. OF QUESTIONS	MARKS
Head and Neck, Brain and Spinal cord, Thorax including diaphragm and Upper limbs	Long essay x 2 x 10*	20
Head and Neck, Brain and Spinal cord, Thorax including diaphragm and upper limbs	Short essays x 10 x 5*	50
General Anatomy, Histology and Embryology and also Head and Neck, brain and Spinal cord, Thorax including diaphragm and Upper Limbs	Short answer x 15 x 2*	30

* Indicates marks per question

PAPER - II

CONTENTS	TYPE & NO. OF QUESTIONS	MARKS
Abdomen, Pelvis and Lower limbs	Long essay x 2 x 10*	20
Abdomen, Pelvis and Lower limbs	Short essays x 10x 5*	50
Systemic Histology and Embryology, Genetics and also Abdomen, Pelvis and Lower limbs	Short answer x 15 x 2*	30

* Indicates marks per question

Sectionwise distribution of marks in written paper

Each paper shall have two sections. Each section shall carry 50 marks. There shall be one long essay, five short essay and seven or eight short answer type of questions in each section.

PRACTICAL: *Total marks 80: Gross Anatomy : 50 , Histology : 30*

Gross Anatomy - 50 marks

a. Spotters : Identification of structures in given specimen, each carrying two marks.
Five specimens to be kept, one of which shall be a cross section = 10 marks

b. Discussion on two given dissected specimen, each carrying 15 marks

Upper half above diaphragm - 15 marks

Lower half including diaphragm - 15 marks = 30 marks

c. Surface Anatomy = 10 marks

a + b + c = 50 marks

Histology - 30 marks

a. Identification of 9 slides and interpretation of one chart on genetics, each carrying one mark = 10 marks

b. Discussion on two given slides 10 x 2 = 20 marks

a + b = 30 marks

ORAL EXAMINATION (VIVA-VOCE) - 60 marks

Oral examination will be conducted by four examiners individually. The distribution of topic and marks for each examiner will be as under:

I : Questions on embryology (with models) = 10 marks

II : Radiological anatomy including ultrasound, C.T. and MRI = 10 marks

III : Osteology and soft parts in the regions of head and neck, brain and spinal cord, thorax including diaphragm and upper limb. = 20 marks

IV : Osteology and soft parts in the region of abdomen, pelvis and lower limb = 20 marks

60 marks

e. RECOMMENDED TEXT AND REFERENCE BOOKS:

TEXT BOOKS

1. *SNELL (Richard.S),* **Clinical Anatomy for Medical Students :** Ed.5. Little Brown and Company, Boston.1995, p898. $26.50
2. *MOORIE (Kieth L),* **Clinically Oriented Anatomy.** ed.3., Williams and Wilkins, Baltimore, 1992,p917. $30
3. *DATTA (A.K),* **Essentials of human anatomy: Thorax and Abdomen**.ed.3.Vol.I,Current Book International, Calcutta. 1994, p433. Rs.200/-

   DATTA (A K), **Essentials of human anatomy; Head and Neck.** Ed2. Vol II, Current Book International, Calcutta 1994, p363. Rs.200/-

   DATTA (A K), **Essentials of human anatomy; Neuroanatomiy,** Vol. IV Current Book International, Calcutta, 1995, p289. Rs.150/-
4. *SINGH (Inderbir),* **Text Book of anatomy with colour atlas: Introduction, Osteology, Upper extremity, Lower extremity.** Vol I. JP brothers, New Delhi. 1996 , Rs. 200/-

   SINGH (Inderbir), **Text Book of anatomy with colour atlas: Thorax and Abdomen.**
   Vol. II JP brothers, New Delhi. 1996, Rs.175/-

   SINGH (Inderbir), **Text Book of anatomy with colour atlast: Head and Neck Central Nervous System.** Vol.III. JP brothers, New Delhi 1996 Rs. 175/-
5. *SINGH (Inderbir),* **Human Osteology.** JP brothers, New Delhi. 1990. P191. Rs.50/-

PRACTICALS

1. ROMANES (G J), **Cunningham manual of practical anatomy:** upper and **lower limb** ed.15.Vol.I Oxford Medical Publication, Oxford 1996. P263. Rs.325/-
2. ROMANES (G J), **Cunningham manual of practical anatomy: thorax and abdomen.** Ed 15. Vol II. Oxford Medical publication, Oxford. 1996. P298. Rs.325/-
3. ROMANES (G J), **Cunningham manual of practical anatomy: Head and Neck** and brain ed. 15.Vol III. Oxford Medical publication, Oxford. 1996. P346. Rs. 325/-

HISTOLOGY:

1. *SINGH (Inderbir),* **Text Book of Histology** ed.1 Jaypee brothers, New Delhi 1987. P303
2. *COPENHAVER (WM),* **Bailey's Text book of Histology** ed.16, Williams and Wilkins, Baltimore. 1971. P745

EMBRYOLOGY:

1. *MORRIE (Keith L) and PERSAUD (TVN),* **The Developing Human Clinically oriented Embyology.** Ed. 5. W B Saunders, Philadelphia, 1993. P493. $17.50
2. *LANGMAN,* **Medical Embryology: human development-normal-abnormal.** Ed. 3.William and Wilkins. Baltimore. 1976, P421. Rs. 75/-
3. *DATTA (A K),* **Essentials of Human Embryology.** Ed. 3. Current Books International Calcutta. 1995. Rs. 200/-
4. *SINGH (Inderbir),* **Human Embryology**. Ed 5. Macmillan India Ltd., Madras. 1986. Rs.195/

NEUROANATOMY:

1. *DATTA (A K),* **Essentials of Anatomy: Neuroanatomy.** Ed 1. Current Book International Calcutta. 1995. P289. Rs. 150/-

REFERENCE BOOKS

1. *WILLIAMS (Peter L)* **Gray's Anatomy.** Ed. 38 Churchil Livingstone, 1995. P2092.
2. *DECKER (CAG) AND DJ DUPLESSIS,* **Lee Mcgregor's synopsis of surgical anatomy** ed.12. K M Varghese and Co ., Bombay. 1986, p626, Rs. 375/-
3. *McMINN (RMH),* **Last's Anatomy regional and applied** ed 8 ELBS, UK, 1992, p707. L8-95
4. *BASMAJIAN (J V),* **Grant's method of anatomy** ed 10, Williams and Wilkins Baltimore. 1980 p823. $20.00

ATLAS

1 *ROSS (Michael. J D) et.al.,* **Histology; text and atlas**. Ed 3. Williams and Wilkins,Baltimore. 1995, p823 $20.00

2. *DIFIORE (Mariand. S H),* **Atlas of normal histology** Ed 6. Lea and Febiger. 1989. P2687. Rs.350/-

SURFACE ANATOMY:

1. *ROBINSON (Rawling J O),* **Landmarks of surface markings of the human body,** Ed 9. Lewis and Co., 1953.p

2. *HALIM (A),* **Surface and Radiological Anatomy.** Ed 2, CBS. Publishers and Distributors, New Delhi 1996. P225. Rs.73/-

GENETICS:

1. *EMERY (Alan H) and MULLER (Robert F),* **Elements of Medical Genetics**; Student Notes. Ed 8, ELBS. UK. 1992. P349. L 3.95

PHYSIOLOGY

a. OBJECTIVES

At the end of the course, the student should be able to:

1. Describe the normal functions of all organ systems regulatory mechanisms and interactions of the various organs for well co-ordinated total body function.
2. Understand the basic principles, mechanism and homeostatic control of all the functions of human body as a whole.
3. Elucidate the physiological aspect of normal growth and development.
4. Analyse the physiological responses and adaptation to different stresses during life processes.
5. Lay emphasis on applied aspect of physiological functions underlying disease state.
6. Correlate knowledge of physiology in areas indicated by National Health Programmes.
7. Acquire the skills to do the experiments for study of physiological function.
8. Interpret experimental and investigative data.
9. Distinguish between normal and abnormal data derived as a result of tests which he/she performed and observed in the laboratory.

b. COURSE CONTENTS

1. THEORY

I. GENERAL PHYSIOLOGY (8 Hrs)

1. Homeostasis, concepts of physiological norms, range and variations, active andpassive transport, relationship between stimulus and response.
2. Structure of cell membrane, retying membrane potentials, cellular receptors, intercellular communications.

II. BODY FLUIDS - BLOOD (6 Hrs)

1. Body fluids - Compartments, blood composition, cellular elements of blood, their formation and regulation.

   Changes in Body fluid compartments, Hypoproteinwise, replacement of Body fluid loss. Haemoglobin and functions, jaundice, anaemias and their classification, haemostastic mechanisms, anticoagulants, blood groups, Rh incompatibility, blood transfusion; ESR; Basic mechanisms of immunity with respect to lymphocytes and functions of WBCs. Lymph.

III. NERVE AND MUSCLE (8 Hours)

1. Classification; electrical, mechanical properties. Mechanism of muscle contraction and its molecular basis. Neuromuscular transmission, Smooth muscle, electrical and mechanical properties, nerve supply, neuro-transmitters, Mysthenia Gravis.

IV. GASTROINTESTINAL TRACT (12 Hours)

1. Functional morphology, functions, regulation of secretion of salivary glands, stomach small intestine and large intestine; regulation of gastrointestinal movements; functions of gall bladder, liver; site of production and action of G I hormones, Mechanism -intestinatal absorption of food principles.

   Physiological basis of peptic ulcer and diarrhoea.

V. KIDNEY (10 Hours)

1. Functions of different parts of nephron in urine formation. Role of kidney in water and electrolyte balance. Acidification of urine, diuresis, kidney function tests. Juxtaglamerular apparatus; Renin-Angiotension system. Renal blood flow. Structure and innervation of bladder; micturition, cystometrogram. principles of artificial kidney.

VI. SKIN AND BODY TEMPERATURE (ENVIRONMENT) (2 Hours)

Structure and functions of skin, Regulation of Body temperature.

COMMUNITY HEALTH CELL
LIBRARY AND DOCUMENTATION UNIT 31
05481

(16 Hours)

VII. ENDOCRINE GLANDS

(To be integrated with Biochemistry)

1. General principles of regulation of endocrine glands. Hormones, functions, regulation of secretion. Experimental and clinical disorders of anterior and posterior pituitary thyroid, parathyroid, adrenal cortex, adrenal medulla and endocrine pancreas. Stress and hormones. Physiology of growth.

VIII. REPRODUCTION

Puberty, Sex determination and differentiation.

1. *Male Reproduction :* Regulation and functions of testis, constituents of semen, ejaculation, testicular hormones, puberty, spermatogenesis and regulations.

(3 Hours)

2. *Female Reproduction :* Menstrual cycle ; Changes in ovary ; uterus, cervical mucus, vagina and hormonal regulation. Ovulation and its detection, fertilisation, implantation, physiological changes during pregnancy, parturition, lactation placenta, physiology of lactation, menopause. Physiology of newborn.

(8 Hours)

3. *Family Planning and Welfare:* Physiological basis of contraception in males and females. Principles of use of oral contraceptives, safe period rhythm and other methods of contraception.

(4 Hours)

IX. CARDIOVASCULAR SYSTEM (25 Hours)

1. Functional anatomy of heart, properties of cardiac muscle, electrical and mechanical changes in cardiac cycle, conducting system of heart, normal ECG. Cardiac output measurement in man, physiological variations. Regulatory mechanisms of heart rate and blood pressure. Regional circulation's; normal values, physical principles governing flow of blood in heart and blood vessels, measurement and regulation of coronary, cerebral, skin. Changes in CVS during muscular exercise, postural changes, hypovolemia, hypoxia and cardiopulmonary resuscitation. Micro circulation. Pathophysiology of hypertension, shock, cardiac failure and coronary artery disease.

X. RESPIRATORY SYSTEM (12 Hours)

1. Functional anatomy of respiratory system. Mechanics of normal respiration. Physical principals governing flow of air in respiratory passages. Lung compliance, alveolar ventilation, ventilation perfusion ratio, oxygen and carbon dioxide transport, Diffusing capacity, pulmonary function tests, Regulation of respiratory, respiratory acidosis and alkalosis pulmonary blood flow. Hypoxia, cyanosis, asphyxia, Respiratory adjustments during muscular exercise, hyperbaric conditions, principles of oxygen therapy, artificial respiration. Hyaline membrane disease. Pathophysiology of obstructive and restrictive disorders. Pulmonary oedema, decompression sickness, hyperbolic oxygen therapy, dyspnoea.

XI. CENTRAL NERVOUS SYSTEM (30 Hours)

1. Organisation of the central nervous system. Functions and neuronal organisation at spinal cord level. Synaptic transmission. Motor and sensory systems and their lesions. Reticular system in brain stem, sleep, wakefulness, EEG waves and physiological changes in EEG. Clinical lesions and experimental sections at spinal cord, brain stem and sub-cortical levels. Physiology of basal ganglia, cerebellum, thalamus, hypothalamus, limbic system, prefrontal lobe and cerebral cortex. Speech and its disorders. Autonomic nervous system. Formation and functions of CSF. Blood brain barrier, central Neurotransmitters. Neuroglia. Physiological basis of CNS disorders like Alzheimer's disease, Parkinsonism, Syringomyelia, Tabes doornails.

XII. SPECIAL SENSES (10 Hours)

Eye

1. Image formation of retina. Errors of refraction, functions of aqueous humour, intra-ocular tension. Mechanisms of accommodation, dark adaptation, pupillary reflexes, functions of retina. Optic pathway and lesions. Field of vision. Colour vision, Acuity of vision, photochemistry of vision. Nutritional deficiency - blindness.

2. Structure of photoreceptors, generator potentials of rods and cones.

Auditory Apparatus:

1. Role of tympanic membrane, middle ear, cochlea in hearing.
2. Auditory receptors and pathway.
3. Deafness and its causes.

Vestibular Apparatus:

1. Functions, connections and lesions of Vestibulocular apparatus, nystagmus.
2. Tests of vestibular functions

Taste and Smell

Modality, Receptors, Pathway.

Receptor, pathways and cortical and limbic areas associated with taste and smell.

2. PRACTICAL

The following list of practical is minimum and essential. Additional exercises can be included as and when feasible and required. All the practical have been categorised as Procedures (earlier designated as experiment) and Demonstrations. The Procedures are to be performed by the students during practical classes to acquire skills. Some of these would be included in the practical during University examination. Those categorised as 'Demonstration' are to be shown to students during practical classes. However, these demonstrations would not be included in the university examinations, but questions based on these would be given in the form of data, charts, graphs, problems and case-histories, for interpretation by students, (formerly called as dry experiments and charts).

I. HAEMATOLOGY (30 Hours)

Procedure

Preparation and staining of blood films; identification of blood cells in a stained film; total and differential leukocyte count; RBC count; estimation of haemoglobin; fragility of red blood cell; erythrocyte sedimentation rate, haematocrit value; blood grouping; bleeding and clotting time. Laboratory classification of anaemia's and determination of absolute indices like MCH, MCHC, MCV, Colour index.

Demonstration:

Methods of blood collection, enumeration of reticulocyte and platelets, absolute eosinophil count.

II. NEURO-MUSCULAR PHYSIOLOGY (30 Hours)

Procedure:

A. Human - Masso's ergometry

Demonstration:

B. Electromyography

C. Skeletal Muscle

Study of laboratory appliances in experimental physiology; Frogs gastrocnemius - sciatic muscle nerve preparation, simple muscle curve, effects of increasing strength of stimuli, effects of temperature; genesis of fatigue, effects of two successive stimuli; genesis of tetanus, effect of after load and free load on muscle contraction and calculation of work done; velocity of nerve impulse insciatic nerve of the frog.

D. Smooth Muscle :

Demonstration of frog's muscle: Recording of contraction of frog's rectum,

Recording of movements of small intestine (rabbit).

III. ENDOCRINES AND REPRODUCTIVE SYSTEM

IV. CARDIOVASCULAR SYSTEM (18 Hours)

Procedure

Clinical examination of cardiovascular system, sphygmomanometry; effect of exercise and posture on blood pressure, radial pulse, cold-pressure test.

Demonstration

1. Electrocardiography, Sinus Arrhythmia Demonstration.
2. Experimental cardiogram; effect of warmth and cold on sinus venosus and ventricle; extra systole and compensatory pause; properties of cardiac muscle, effect of acetylcholine, adrenaline, nicotine and atropine on frog heart; perfusion of blood vessels of frog; perfusion of mammalian heart and effect of drugs on it; perfusion of frog's heart and effect of ions on it.

V. RESPIRATORY SYSTEM (15 Hours)

Procedure:

Pulmonary function tests including spirometry; clinical examinations of respiratory system; stethography; cardio-pulmonary resuscitation; respiratory response to exercise.

Demonstration

Maximum Ventilatory Volume (MVV)

(9 Hours)

VII. NERVOUS SYSTEM

Procedure :

Examination of motor system, sensory system and cranial nerves; examination in a reflexes of normal subject.

Demonstration

Examination of autonomic functions.

(8 Hours)

VIII. SPECIAL SENSES

Procedure :

Perimetry, acuity of vision-distant and near; colour vision; tests on smell and taste; tuning fork tests.

Demonstration

Principles of ophthalmoscopy and retinoscopy; examination of fundus. Audiometry, Purkinje - Samson images.

c. TEACHING HOURS AND METHODS

1. Total Number of Hrs. - 480

Theory Didactic Lectures	-	160 Hrs.
Non Lecture teaching	-	80 Hrs.
Practical/Demonstrations	-	240 Hrs.

2. Systemwise Distribution of Teaching Hours

Sl.No.	System	No.Hrs.
1	General Physiology	8
2	Body Fluids - Blood	16
3	Nerve-Muscle	8
4	Gastro-Intestinal	12
5	Kidney	10
6	Skin, Body temperature	2
7	Endocrine	16
8	Reproduction	10
9	Cardio Vascular	25
10	Respiration	12
11	Central Nervous System	30
12	Special Senses	

NOTE: THE FOLLOWING COURSE CONTENTS HAVE BEEN CLASSIFIED AS "DESIRABLE TO KNOW".

There will be relatively low emphasis on these during teaching. Questions from these areas need not be asked in written examination. However, in oral examination, questions may be asked from these areas only to award class or rank . Performance of a candidate based on these questions only should not determine pass or fail.

THEORY

I. GENERAL PHYSIOLOGY - Physiochemical property of membrane : cell inclusions and functions.

II. BODY FLUIDS & BLOOD - Changes of body fluid compartments in disease, hypoproteinmia , oedema, replacement of body fluids, effect of lymphatic obstruction, function of Thymus, Auto immunity, AIDS, functional properties immunoglobins.

III. NERVE & MUSCLE - Thermal changes, Oxygen debt, mechanical efficiency, Effects of denervation, neuro muscular disorders, details of chemical changes in muscle contraction.

IV. GASTRO INTESTINAL TRACT - Physiological basis of investigating disorders of secretion and motility, and Effects of disorders of secretion and motility, Physiologic basis of peptic ulcer and achalasia; motility disorders, Liver function tests, diarrhoea and its treatment.

V. KIDNEY - Mechanism of action of diuretics, renal failure, disorders of micturition.

VI. ENDOCRINE GLANDS - Sythesis and transport of hormones, receptors and blockers: Functions of local hormones; pineal; cellular mechanism of hormonal action, investigation.

VII. REPRODUCTION

Male Reproduction: Abnormalities of testicular function, sex determination and differentiation.

Female Reproduction: Foetoplacental unit, composition of milk, colostrum, nutritional needs of mother and child during pregnancy and lactation, investigation for infertility.

VIII. CARDIO VASCULAR SYSTEM - Foetal circulation, Effects of gravitational hypoxia, Principles of electrocardiograph, echocardiography and cardiac catheterisation.

Arrhythmia's, pathophysiology of cardiac failure, hypertension, valvular disorders and coronary and heart disease.

IX. CENTRAL NERVOUS SYSTEM - Evoked potentials, Imaging techniques.

X. SPECIAL SENSES

Eye: Role of visual cortex in perception. Structure of photoreceptors generator potentials of rods and cones.

Auditory Apparatus: Audiometry, theories of hearing.

Vestibular Apparatus: Mechanism of habituation of Vestibular Apparatus.

Taste and Smell : Disorders of taste and smell perception.

XI. Principles of Yoga, meditation and exercise in sports medicine.

PRACTICAL

The following practical were considered not necessary at this stage and therefore need not be performed or demonstrated.

I. Demonstration in Haematology :
Arneth count, Viscosity, blood volume estimation, Bone marrow smear.

II. Neuro-muscular Physiology :

A. Human - Treadmill, mechanical efficiency of human body, Velocity of new impulse and strength duration curve in humans.

III. Metabolism, Body temperature & Kidney.

IV. Endocrine & Reproductive system.

V. Card Vascular System -

Echocardiography, cardiac output in dogs; record of blood pressure, venous pressure, respiration in animals (dog) and effect of various factors on it; effect of exercise on hemo-cardio-respiratory system. Recording of arterial pulse, Jugular venus pulse and its clinical importance. Cardiac function tests. Triple response.

VI. Respiratory System: Dander's model for mechanism of respiration. Mueller's manoeuver, collection and analysis of respiratory gases, uses of Douglas bag (to be integrated with Anaesthesiology department)

VII. Nervous System : Examination of autonomic functions.

d. SCHEME OF EXAMINATION

INTERNAL ASSESSMENT
Total Marks : 60 Theory (40 and Practical 20)

THEORY: 40 Marks

Minimum of three examinations are recommended. The sessional examination preceding the University examination may be similar to the pattern of University examination. Average of any two best marks obtained in the notified internal examinations be taken into consideration for calculating internal assessment. The total marks be reduced to 40 and sent to the University.

PRACTICAL: 20 Marks

There will be two terminal practical examinations. Five marks will be for records and 15 marks for terminal tests. Average marks of the two terminal examinations shall be reduced to 15 marks and added to the marks obtained for records and the sum of the two shall be sent to the University.

The internal assessment marks both theory and practical obtained by the candidates should be sent to the University at least fifteen days prior to the commencement of theory examination.

UNIVERSITY EXAMINATION

THEORY

There shall be two papers each carrying 100 marks. The pattern of questions would be of three types.

Long essay question	- each question carrying	10 Marks
Short essay question	- each question carrying	5 Marks
Short answer questions	- each question carrying	2 Marks

Distribution of chapters in Paper I and Paper II in Physiology for University examination shall be as follows:

PAPER - I

General Physiology (4), Blood (20), Cardiovascular system (24), Respiratory system (20), Gastrointestinal system (20), Renal system (12). (Note: Marks for Renal and Gastro intestinal

system can be interchanged. (Figures shown in parentheses are weightage of marks recommended for the different topics)

PAPER - II

Endocrines (20), special senses (20), Reproduction (12), Central Nervous System (28), Muscle-Nerve (16), Skin and Body Temperature (4). (Note: Marks for Endocrines and Reproduction can be interchanged. (Figures shown in parentheses are weightage of marks recommended for the different topics)

Sectionwise distribution of marks in written paper

Each paper shall have two sections. Each section shall carry 50 marks . There shall be one long essay, five short essay and seven or eight short answer type of questions in each section.

PRACTICAL

There shall be two practical sessions, Practical I and II, each carrying 40 marks. Each practical will be of 2 hrs., duration. The distribution of content and marks for the practicals would be:

Practical I		Marks
1.	Clinical examination	20
2.	Human Physiology Practical II	20
3.	Haematology (Major) (Minor)	20 10
4.	Interpretation of graphs/charts/case histories	10

ORAL EXAMINATION (VIVA-VOCE)

The oral examination shall carry 60 marks and all examiners will conduct oral examinations for the candidates.

Table 1 - Portion of Paper - I - 30 Marks

Table 2 - Portion of Paper -II - 30 Marks

e. RECOMMENDED TEXT AND REFERENCE BOOKS

Deciding which textbook to buy is not an easy task. Choice of a text book depends on the individual and his or her aptitude. It is desirable, and would certainly be helpful if each student has one text book out of the recommended list of text books. We suggest that you browse through, try each one out and take your time before your decide which one you would like to invest one suits your particular temperament and of course for you to fall back on if you really cannot afford to invest in a text book of your own. Remember, there is no ideal text book; all share their imperfections and yet each one of them has much to offer. Obviously cost is also an important criteria.

The list of books under the section Reference books are categorised under three levels of difficulty - level one being the easiest. The books under level one are meant to provide an overall, simple but comprehensive account of Physiology. Books at level two can be considered as alternative text books and some of them are excellent books for further reading. Level three books are really meant for purposes of reference during advanced study in any special area of Physiology.

TEXT BOOKS

1. *GUYTON (Arthur C),* **Textbook of Physiology**. Ed 8. Prism Publishers, Bangalore. 1991. p1041, Rs. 470/-

2. *GANONG (william F),* **Review of Medical Physiology.** Ed 18, Appliton and Lange. 1997, p629, $18.00

3. *ESMLIE - SMITH (Donald) et.al.,* **Text Book of Physiology,** ed 11, Churchil Livingstone, *Edinburgh.* 1988. P548

4. *VENDOR (Arthur J) et.al.,* **Human physiology** Ed 6, Mcgraw Hill Inc. 1994, p754. $18.50

5. *SELKURT (Enald E),* **Basic physiology for the health sciences,** Ed 2, Little Brown, Boston. 1982. P 656, $36.50

6. *CHOUDHARI (Sujith K),* **Concise medical physiology,** Ed 1, New Central Books, Calcutta, 1993. Rs. 415/-

7. *TORATORA (Gerald J),* **Principles of anatomy and physiology** Ed 1, Harper Collins College Publication, 1996. P986. $39.00

8. *CHATTERJEE (CC),* **Human Physiology** Ed 10, Vol I,Medical Allied Agency, 1988,Rs.150/ CHATTERJEE (CC) Human Physiology: Central Nervous System. Ed 11, Medical Allied Agency. 1988, p758. Rs.150

9. *BIJLANI (RL),* **Understanding medical physiology: text book for medical students.** Ed 1, Jaypee brothres, New Delhi 1995, p932, Rs.233/-

REFERENCE BOOKS

Level 1

1. *GREEN (J H),* **Basic Clinical Physiology**, Ed 1, ELBS UK 1969. P146
2. *SELKURT (Enald E),* **Basic Physiology** for the health sciences, Ed 2. Little Brown Boston, 1982. P656, #37.50
3. *MORAN (Campbell E J),* **Clinical Physiology**, ed 4 ELBS UK. 1975 p850 L 40.00

Level 2

1. *BERNE (Robert M) and LEVEY (Mathew),* **Physiology,** Ed 3, Mosby publication. 1993 p1071 $40.00
2. *SCHMIDT (RF) and THEWS (G),* **Human Physiology.** Ed 2 Spinger Verlog London 1989. P825. DM 128.00
3. *WEST (John B) Best and Taylor's,* **Physiological basis of Medical Practice,** Ed 12 William and Wilkins. Baltimore. 1990, p1170. $40.00
4. *KEELE (Cyril E),* **Samson wright's applied physiology** ed 13, Oxford University Press, Oxford 1982. P613. Rs.345

Level 3

1. *MOUNTCASTLE (Veernow B),* **Medical Physiology,** Ed 13. Mosby, St. louis 1974 p836
2. *PATTON (Harry d),* **Text book of physiology** ed 21 W B Saunders and Co., Philadelphia. 1989. P1584. $52.00

Experimental Physiology

There is no one text book on experimental physiology that may be recommended with impunity. However, there is certainly no need for an undergraduate medical student to invest in one. Some useful books to refer to are:

1. *Dacie & Lewis,* **Practical Haematology,** Ed. 7, 1991
2. *Rannade,* **Practical Physiology,** 1993
3. *Ghai,* **A text book of Practical Physiology,** Ed. 4, Reprint 1993
4. *Macleod*, **Clinical Examination,** Ed. 4. 1986
5. *Hutchinson Hunter,* **Clinical Methods,** Ed. 20, 1995

BIOCHEMISTRY

a. GOALS & OBJECTIVES

GOAL

The knowledge acquired in Biochemistry should help the student to integrate molecular events with structure and function of human body in health and disease. Towards this, the departments would facilitate:

1. To enable students understand the scientific basis of life processes at the molecular level and orient them towards the application of knowledge acquired in solving clinical problems.
2. To acquire basic practical skills for biochemical investigations in order to support clinical diagnosis of common disorders in the community, and
3. To promote research activities for students and staff.

OBJECTIVES

At the end of the course, the student shall be able to :

1. Enlist and describe the cell originals with their molecular and functional organisation.
2. Delineate structure, function and interrelationship of various biomolecules and consequences of deviation from normal.
3. Understand basic enzymology and emphasise on its clinical applications wherein regulation of enzymatic activity is disturbed.
4. Describe digestion and assimilation of nutrients and consequences of malnutrition.
5. Describe and integrate metabolic pathways of various biomolecules with their regulatory mechanisms.
6. Explain the biochemical basis of inherited disorders with their associated sequelae.
7. Describe mechanisms involved in maintenance in water, electrolyte and acid base balance and consequences of their imbalances.
8. Outline the molecular mechanism of gene expression and regulation, basic principles of biotechnology and their applications in medicine.
9. Understand with basic immunology involving molecular concepts of body defence mechanisms and their applications in medicine.
10. Continue to learn advancements in biochemistry and apply the same in medical practice.

SKILLS

1. Conduct conventional and selected special investigations.
2. Analyse and interpret laboratory data.
3. Demonstrate skills for solving clinical problems to arrive at diagnosis using laboratory data.

b. COURSE CONTENT

1. THEORY

I. INTRODUCTION & SCOPE OF BIOCHEMISTRY

II. CELL AND SUB- CELLULAR STRUCTURES

- A. Cell membrane - Composition
- B. Functions of sub-cellular structures.
- C. Transport across the cell membrane :
  - i. Active Transport
    (03 Hours)
  - ii. Facilitated diffusion
  - iii. Receptor mediation
  - iv. Endocytosis

III. HYDROGEN ION CONCENTRATION, ACIDS, BASES, BUFFERS, HANDERSON- HASELBACH EQUATION (02 Hours)

IV. ISOTOPES AND THEIR APPLICATION (01 Hours)

V. CARBOHYDRATES (06 Hours)

- a. Definition, Classification and Biological importance
- b. Monosacharides : Structures, Classification and properties - isomerism
- c. Stereoisomerism.
- d. Oligosaccharides : Disaccharide's - structure and their importance.
- e. Polysaccharides : Homo and heteropoly - saccharides - structure and their functions.

VI. AMINO ACIDS, PEPTIDES AND PROTEINS (08 Hours)

a. Amino acids : Classification, Properties, side chains of amino acids, charge properties.

b. Peptides : Biologically important peptides - GSH, Insulin - its structure.

c. Proteins: Plasma proteins functions and their importance in health and disease

   i. Definition

   ii. Biological importance of proteins

   iii. Classification and properties, charge properties

   iv. Structural organisation; Conformation and denaturation.

VII. LIPIDS (05 Hours)

Definition, classification and Biological importance -

a. Simple lipids: Tricyglycerol and waxes - structure and composition.

b. Compound lipids: phospholipid - Spingolipids, Glycolipids and their composition and function.

c. Derived lipids. Fatty acids : saturated, unsaturated and their properties ii. Steroids

VIII. NUCLEIC ACIDS (04 Hours)

a. Definition biological importance

b. Classification, composition

c. Purines and pyrimidine - bases nucleosides, nucleatides, biological important nucleotides.

d. DNA : Structure and Function

e. RNA : Types of RNA - Structure and function.

IX. ENZYMES (07 Hours)

a. Definition, Classification, Specificity, Ceezymes, co-factors, activators.

b. Mechanism of enzyme action.

c. Factors affecting enzyme activity - Km value and its importance.

d. Enzyme inhibition : reversible and irreversible competitive and other types; its clinical application.

e. Regulatory enzymes : Proenzymes Zymogen Isoenzymes, allosteric enzymes and feed-back control.

f. Diagnostic and therapeutic importance of enzymes.

X VITAMINS (10 Hours)

Definition, Classification and :

a. A brief account of chemistry, source, deficiency diseases and biochemical role. Recommended Dietary Allowances (RDA)
b. Vitamin antagonists
c. Hypervitaminosis.

XI. BIOLOGICAL OXIDATION (03 Hours)

Mitochondrial electron transport chain, oxidative phosphorylation, mechanism uncouplers and inhibitors.

XII. DIGESTION AND ABSORPTION FROM GASTRO INTESTINAL TRACT (03 Hours)

a. Digestion and absorption of carbohydrates, lipids, proteins and nucleic acids.
b. Malabsorption syndromes.

XIII. INTERMEDIARY METABOLISM (02 Hours)

XIV. CARBOHYDRATES METABOLISM (10 Hours)

a. Glycogenesis and Glycogenolysis and Cori cycle.
b. Glycolysis, Rapoport - Leubering cycle, pyruvate oxidation, citric acid cycle.
c. Pentose phosphate pathway.
d. Uroric acid pathway
e. Gluconeogenesis.
f. Metabolism of Fructose and Galactose.
g. Regulation of metabolic pathways.
h. Metabolic disorders of carbohydrates.
i. Regulation of Blood sugar; Glucose Tolerance Test, Diabetes Mellitus.

XV. LIPID METABOLISM (08 Hours)

a. Oxidation of fatty acids, propionate metabolism, formation and utilisation of ketone bodies, ketosis, outline of synthesis of cholestrol *(reactions up to mevaonate in detail)* and breakdown of cholesterol, metabolic disorders of lipids.

b. Lipogenesis, Denovo synthesis of fatty acids, fatty acids chain elongation, desaturation, phospholipid biosynthesis (for example : Lecithins and Cephalin) and their breakdown.

c. Fatty livers and lipotropic factors.

d. Prostaglandins and their biological functions only

e. Plasma Lipoproteins - Classification and functions.

XVI. PROTEIN AND AMINO ACID METABOLISM (10 Hours)

a. Breakdown of tissue proteins and amino acid pool. General reactions of amino acids.

b. Disposal of ammonia : Urea cycle, glutamate and glutamine formation.

c. Metabolism of individual amino acids (Glycine - Serine, sulphur containing amino acids, aromatic amino acids, Histidine)

d. Metabolic disorders of amino acids.

XVII. PURINE AND PYRIMIDINE METABOLISM (03 Hours)

a. Sources of various atoms of purine and pyrimidine synthesis and breakdown.

b. Salvage pathway.

c. Metabolic disorders of purine and pyrimidines and Gout.

XVIII. MINERALS (06 Hours)

Calcium, Phosphorous, Iron, Copper, Iodine, Zinc, Fluoride, Magnesium, Manganese and Selinium.

XIX. BIOCHEMICAL GENETICS AND PROTEINS BIOSYNTHESIS (10 Hours)

a. Replication, transcription, reverse transcription, oncogenes, post transcriptional modification.

b. Translation: Functions of m-RNA, r-RNA, t-RNA, Amino acid activation, initiation, elongation and termination, Post translational modification.

c. Mutation.

d. Recombinant DNA technology, gene therapy

XX. TISSUE BIOCHEMISTRY (12 Hours)

a. Outline of haeme synthesis, degradation of haeme, Functions of haemoglobin
b. Abnormal haemoglobins.
c. Jaundice
d. Porphyrias
e. Plasma proteins : Separation , functions and importance.
f. Immunoglobulins : Structure and functions.
g. PH of blood and its regulation - acidosis and alkalosis. Principles of estimation of body fluids. Role of kidneys and lungs in blood PH maintenance.

XXI. LIVER FUNCTIONS (04 Hours)

a. Liver Function Tests
b. Detoxication mechanisms: Xenobiotics

XXII. NUTRITION AND ENERGY METABOLISM (05 Hours)

BMR and its importance, calorific values of food, RQ, SDA, Balanced Diet, Protein energy ,malnutrition. Biological value of proteins, Nitrogen equilibrium, Dietary fibre, Biochemistry of starvation.

2. PRACTICALS

a) Practicals to be performed by students:

1. Reactions of Monosaccharides - Glucose and Fructose
2. Reactions of Di saccharides - Lactose, Maltose, Sucrose.
3. Reactions of Polysaccharides - Starch.
4. Indentification of an unknown carbohydrate.
5. Precipitation and coagulation reactions of proteins.
6. Colour reactions of proteins - albumin, casein, gelatin, and peptone
7. Identification of an unknown protein.
8. Reactions of NPN Substances - urea, uric acid and creatinine.
9. Identification of substance of physiological importance.
10. Normal constituents of urine.
11. Analysis of abnormal urine.
12. Spectroscopic examination of Haemoglobin, derivatives - *preparation of Haemin crystals.*
13. Estimation of Blood sugar
14. Estimation of blood urea

15. Estimation of Serum cholesterol.
16. Estimation of serum inorganic phosphate and interpretation.
17. Estimation of total proteins and A:G ratio.
18. Estimation of urine creatinine and interpretation.
19. Estimation of Albumin in urine.

b) Practicals for Demonstration only:

1. Colorimetry.
2. Chromatography
3. Paper electropheresis
4. Glucose tolarance test.
5. Determination of SGOT, SGPT.
6. Determination of Serum (bilirubin).
7. Determination of Ascorbic Acid.
8. Principles of Flame Photometry.
9. Determination of Sugar and Protein in CSF

c) Interpretation of charts and case reports.

c. TEACHING HOURS

1.	Lectures	-	120 Hours
	Tutorials	-	20 Hours
2.	Practicals/Demonstration (40x2)	-	80 Hours
3.	Seminar/Integrated Teaching/Monthly Test, Internal Assessment and Revision Classes	-	20 Hours

d. SCHEME OF EXAMINATION

INTERNAL ASSESSMENT
TOTAL MARKS : 30, (THEORY : 20 AND PRACTICAL :10)

THEORY: Minimum of three tests are recommended. The examination preceding the University examination will be similar to the university examination. The total marks would be 20. Average marks of best of two notified internal examinations should be reduced to 20 and should be sent to the University.

PRACTICALS: A minimum of two terminal practical tests is to be conducted, one at the end of each term. Average of the two tests should be reduced to 10 marks and shall be sent to the University.

UNIVERSITY EXAMINATION

THEORY

There shall be one paper carrying 100 marks. The paper shall have two sections and in each section there shall be three types of questions. The distribution of topics for the two sections are given separately.

Type of Questions and distribution of Marks in each section

	Section I		Section II		
Type of Questions	No of Questions & Marks *	Section Marks	No of Questions & Marks *	Section Marks	Grand total
Long Essay	1x10	10	1x10	10	20
Short Essay	5x5	25	5x5	25	50
Short Answer	8x2	16	7x2	14	30
	Section Total	51	Section Total	49	100

* Marks per question

Distribution of topics for Section I and II and weightage marks * in Biochemistry for University examination:

Section-I	Section-II
1. Chemistry of Carbohydrate, Proteins, Lipids and Nucleic Acids. (5)	1. Intermediary Metabolism. (5)
2. Enzymology and clinical Enzymology. (10)	2. Metabolism of carbohydrates. (10)
3. Biochemistry of digestion and absorption of carbohydrates, proteins and lipids. (5)	3. Metabolism of Lipids. (10)
4. Vitamins (10)	4. Metabolism of proteins and nucleic acids. (10)
5. Minerals and Electrolyte balance. (10)	5. Biochemical genetics-protein biosynthesis. (10)
6. Biological Oxidation (5)	6. Hemoglobin-synthesis and degradation. (5)
7. Nutrition and Energy Metabolism (5)	7. Detoxication Mechanism. (5)
8. Acid base balance. (10)	8. Liver function tests, gastric functions. (5)

* Marks for each topic is shown in brackets.

Distribution of topics and Type of question in theory paper.

In section I, Short Eassy and Short Answer type of questions be asked in from topics shown in SLNO: 1, 3, 6 and 7 Long Eassy type of questions may be avoided from those typics. However, Long Eassy type of questions as well as short Eassy and Short Answer type of questions may be asked from topics shown in SL NO: 2, 4, and 8.

In Section II, Short Eassy and Short Answer type of questions be asked from topics shown in SL NO: 1, 6, 7, 8, and Long Essay type of questions may be avoided from these topics. From topics shown in SL NO: 2, 3, 4, and 5, Long Eassy type as well as Short Eassy and Short Answer type of questions may be asked.

PRACTICAL EXAMINATION

The Practical examination consists of two exerises, practical I and II, each of 2 hours duration and each exercise carrying 20 marks.

Practical Exercise I - Two hours, 20 marks

1. Quantitative estimation - Every candidate shall perform one given procedure.
   a) Principle and procedure for the estimation asked in the question should be written by the candidate in the first five minutes. - 5 marks
   b) After collecting the papers correct procedure for the estimation is given and practical examination is done. Total marks would be 15, and the distribution of marks would be:

      for results (values) - 5 marks
      for calculations and reporting - 5 marks
      for interpretation of results and application of the estimation - 5 marks

Practical Exercise II - Two hours, 20 marks

2. Qualitative analysis - Every candidate shall perform one given procedure such as Identification of Carbohydrates, Proteins substance of Physiological importance, Analysis of Normal Urine, Analysis of abnormal Urine. Total marks would be 15 and Distribution of marks would be:

for selection of appropriate reactions	-	5 marks
for reasoning of analysis and correct reporting	-	5 marks
for interpretation of results and application of the estimation	-	5 marks.

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3. Spotters consisting of graphs, charts, case reports, slides containing osazones, Hemin crystals, and instruments. Ten spotters would be given to each student. Each spotter will carry ½ marks. The students have to interpret or identify the reactions, composition of reagents or mention the uses. Total marks would be - 5 marks

ORAL EXAMINATION: (VIVA-VOCE)

The oral examination shall carry 30 marks and all the examiners will conduct the oral examination.

e. RECOMMENDED TEXT AND REFERENCE BOOKS

TEXT BOOKS

1. *MURRAY (ROBERT. KK),* **Harper's Bio Chemitry** Ed. 24, Prentice Hall. 1996, p925. Rs.650/
2. *RAMAKRISHNA (S) , PRASANNA (KG), RAJAN (R),* **Text Book of Medical Biochemistry,** Ed 1, orient Langman, Bombay 1980, p717
3. *VASUDEVAN (DM) and SREE KUMARI (S),* **Text Book of Bio chemistry for Medical students,** Ed 1, Jaypee Brothers, New Delhi, 1995, p637, Rs. 175/-
4. *DAS (Debajyothi),* **Biochemisty,** Ed. 7, Academic Publishers Calcutta, 1992, p648, Rs.175/

REFERENCE BOOKS

1. *LEHININGER (Albert) et al.,* **Principles of Biochemistry,** Ed. 3, LBS Publishers, Delhi, 1993, p 1143, Rs.795/-
2. *ORTEN (James M) and NEUHAUS (OHO.W),* **Human Biochemistry,** Ed. 9, Mosby, St.Louis, 1975 p 994,
3. *STRAYER (Lubert),* **Biochemistry,** Ed. 4, WH, Freeman & Co., Ny.1995, p1064, $49.95
4. *DEVLIN (Thomas M),* **Biochemistry with Clinical Correlation,** Ed.4, Willey Libs, Ny 1997, p1186, $30.95
5. *MONTGOMERY (REX) et.al.,* **Biochemistry Case Oriented Approach,** Ed 5, C V Mosby, St.louis, 1990, p905, $ 16.00

SECTION IV-B

COORDINATED PROGRAMME IN THEORY FOR MBBS PHASE-I OF ONE YEAR COURSE IN ANATOMY, PHYSIOLOGY AND BIOCHEMISTRY

I term

Month	Anatomy	Physiology	Biochemistry	Integrated Teaching
1	General Anatomy General Embryology General Histology General Human Genetics	General Physiology Cell membrane, transport Homeostasis Body fluids Biophysical principles	Cell structure Sub-cellular components Bio physical principles PH, buffersBiochem istry of nucleic acids	
2	Osteology Myology Arthrology	Haematology Muscle physiology	Classification, sources & functions of proteins, carbohydrate & lipids	Anaemia Physiology Biochemistry Pathology
3 & 4	Heart, Blood vessels, Lungs, Pleura Systemic embryology	Cardiovascular system Respiratory system	Plasma proteins Protein synthesis Diagnostic enzymology	
5 & 6	Abdomen Digestive and Genitourinary organs with systemic embryology	Digestive system secretion and motility	Digestive enzymes Vitamins, Digestion and absorption of food principles	

II term

Month	Anatomy	Physiology	Biochemistry	Integrated Teaching
	Pelvis	Renal and reproductive physiology	Liver function, detoxification, renal, function,gestric function	
7 & 8	Neuroanatomy Special senses Neural development	Nervous system Special senses Autonomic Nervous system Endocrine glands	Metabolism of carbo-hydrates, Amino acids, protein, fats, minerals,water.	Endocrine and exorcrine Pancrease (Diabetes Mellitus) Anatomy+ Physiology+ Biochemisty
9 & 10	Brain, Cerebral cortex Ventricular system. Brain coverings, Limbic system.	Higher functions Emotion, behaviour	Neurotransmitter, Radio Isotopes, Biological oxidation, Electron transfer cycle.	CSF Anatomy + Physiology + Biochemistry

SECTION IV-B (Contd)

COORDINATED PROGRAMME FOR DISSECTION/PRACTICAL/DEMONSTRATION

I term

Month	Anatomy	Physiology	Biochemistry
1	Upper limb Dissection Prosected part Histology tissues Muscles Bone marrow	Osmotic effect Osmotic hemolysis of RBC, ESR. Principles of hemocytometry	Voscosity, Principles of colourimetry PH - Meter Spectometry Sp.Gravity of body fluids
2	Lower limb Dissection Prosected part Histology - bone connection tissue Embryology	Heamatology experiments Muscle experiments	Biochemistry test for Carbohydrate Proteins Fats Minerals
3 & 4	Thorax Abdomen Embryology model	Spirometry Stethography Artificial respiration FEV, Breath sounds	

II term

Month	Anatomy	Physiology	Biochemistry
5 & 6	Thorax Abdomen Pelvis Embryology model	Arterial pulse Venous pulse Blood Pressure, ECG (Demon.) Echocardiography (Demon.) Stress test Heart sounds	Urine examination Fractional test meal like function test clearance - value blood area salivary digestion
7 & 8	Head and Neck	Clinical examination of: ● Cranial nerves ● Sensory function ● Motor function	Glucose Tolerance Test: Blood and Urine Glucose estimation Chemistry of food Chemistry of milk
9 & 10	Brain	Examination of higher function, reflexes.	CSF Analysis

SECTION IV-C

TOPICS FOR INTEGRATED TEACHING PROGRAMME DURING MBBS PHASE - I COURSE

I term

Sl.No	Topic	Department to organise	Department to participate
1	Anaemia	Physiology	Physiology, Biochemistry & Pathology.
2	Jaundice	Biochemistry	Physiology, Biochemistry & Pathology.
3	Coronary circulation	Physiology	Anatomy, Physiolory & Biochemistry.
4	Malnutrition and Starvation	Biochemistry	Physiology, Biochemistry & Community Med.
5	Human genetics	Anatomy	Anatomy, Biochemistry & Physiology.

II term

Sl.No	Topic	Department to organise	Department to participate
1	Acid base balance	Biochemistry	Biochemistry & Physiology
2	Thyroid gland	Anatomy	Anatomy, Physiology & Biochemistry
3	Pancreas	Anatomy	Anatomy, Physiology & Biochemistry
4	Stomach	Anatomy	Anatomy, Physiology & Biochemistry
5	Limbic system, Emotion, learning	Physiology	Anatomy & Physiology
6	Growth and Development	Physiology	Anatomy & Physiology
7	Cerebral ventricles, CSF	Anatomy	Anatomy & Physiology

SECTION V

TEACHING OF MEDICAL ETHICS IN M B B S

1. INTRODUCTION

Medical ethics is a systematic effort to work within the ethos of medicine, which has traditionally been service to sick.

There is now a shift from the traditional individual patient doctor relationship of medical care. With the advances in science and technology and the needs of patients, their families and the community, there is an increased concern with the health of the society. There is a shift to greater accountability to the society. Doctors and other health professionals are confronted with many ethical problems. It is, therefore, necessary to be prepared to deal with these problems.

In keeping with its goal to improve quality of education, Rajiv Gandhi University of Health Sciences recommends introduction of medical ethics in the regular teaching of M B B S course beginning from first year and continuing till the end of internship.

2. OBJECTIVES

The objectives of teaching medical ethics should be to enable the students develop the ability to:

1. Identify underlying ethical issues and problems in medical practice
2. Consider the alternatives under the given circumstances, and
3. Make decisions based on acceptable moral concepts and also traditions and practices

3. COURSE CONTENTS (SYLLABUS)

1. Introduction to Medical Ethics

What is Ethics
What are values and norms
Relationship between being ethical and human fulfilment
How to form a value system in one's personal and professional life
Heteronomous Ethics and Autonomous Ethics
Freedom and Personal Responsibility.

2. *Definition of Medical Ethics*

Difference between medical ethics and bioethics

Major Principles of Medical Ethics -

Beneficence	=	fraternity
Justice	=	equality
Self determination (autonomy)	=	liberty

3. *Perspectives of Medical Ethics*

The Hippocratic oath

The Declaration of Helsinki

The WHO Declaration of Geneva

International code of Medical Ethics (1983)

Medical Council of India Code of Ethics

4. *Ethics of the Individual*

The patient as a person

The Right to be respected

Truth and Confidentiality

The Autonomy of decision

The concept of disease, health and healing.

The Right to health

Ethics of Behaviour modification

The Physician - Patient relationship

Organ donation

5. *The Ethics of Human life*

What is human life

Criteria for distinguishing the human and the non-human

Reasons for respecting human life

The beginning of human life

Conception, Contraception

Abortion

Prenatal sex-determination

In vitro Fertilisation (IVF), Artificial Insemination by Husband(AIH),
Artificial Inseminaton by Donor (AID),
Surrogate motherhood, Semen Intrafallopian Transfer (SIFT),
Gamete Intrafallopian Transfer (GIFT), Zygote Intrafallopian Transfer(ZIFT),
Genetic Engineering

6. *The Family and Society in Medical Ethics*

The Ethics of human sexuality
Family Planning perspectives
Prolongation of life
Advanced life directives - The Living Will
Euthanasia
Cancer and Terminal Care

7. *Death and Dying*

Use of life-support systems
Death awareness
The moment of death
Prolongation of life
Ordinary and extraordinary life support
Advanced life directives
Euthanasia - passive and active
Suicide - the ethical outlook
The right to die with dignity

8. *Profession Ethics*

Code of conduct
Contract and confidentiality
Charging of fees, Fee-splitting
Prescription of drugs
Over - investigating the patient
Low - Cost drugs, vitamins and tonics
Allocation of resources in health care
Malpractice and Negligence

9. *Research Ethics*

Animal and experimental research / humanness
Human experimentation
Human volunteer research - Informed Consent
Drug trails

10. Ethical workshop of cases

Gathering all scientific factors

Gathering all human factors

Gathering all value factors

Identifying areas of value - conflict, Setting of priorities,

Working our criteria towards decisions

4. TEACHING / LEARNING EXPERIENCE

Classroom teaching would focus on professional relationship, patient - doctor relationship, issues at the beginning and end of life, reproductive technologies, resource allocation and health policy. It will also deal with values , ethical concepts and principles.

Clinical ethics must be taught as part of bedside teaching. Group discussions, case studies, problem analysing and problem solving exercises may also be employed.

The teacher involved in teaching ethics should show how the ethical principles are applied on a day-to-day and patient to patient basis by:

Demonstrating by example, how to identify and resolve a particular problem.

Increasing the awareness and knowledge of students of the value dimensions of interactions with the patients, colleagues, relations and public.

Fostering the development of skills of analysis, decisions making and judgement.

Making the students aware of the need to respect the rights of the patient as also duties and responsibilities of the doctor.

5. RECOMMENDED READING

Francis C M, **Medical Ethics,** I Ed, 1993, Jaypee Brothers, New Delhi, P 189, Rs.60/-

DIFFERENT METHODS RECOMMENDED FOR INTERNAL ASSESSMENT

The Medical Council of India has given some examples of methods for internal assessment of students which may be followed by the colleges. They are :

1. Credit for preparation and presentation of seminars by students
2. Preparation of clinical case for presentation
3. Clinical case study / problem solving exercises.
4. Participation in project for health care in the community
5. Proficiency in conducting a small research project or assignment.
6. Multiple choice questions (MCQ) test after completion of a chapter / system .

Each item shall be objectively assessed and recorded. Some of the items can be assigned as home work / vacation work.

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